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ABSTRACT

The goal of this panel was to advance the development of theory that improves understanding, prediction, and control of phenomena in the teaching process and their antecedents and consequences. The panel concentrated on the ways and means of advancing theory development in general rather than on the substantive problems of theory development in any particular area of research on teaching. Attention was, therefore, focused on four independent mechanisms that seemed to be most potent in attacking the difficulties involved in theory development. These mechanisms became "approaches" under which programs were organized. The first approach called for the establishment of one or more permanent working groups for the comparative analysis, evaluation, and integration of theoretical developments. The second approach dealt with individual programmatic theory development. Within this approach the panel identified four programs that might be supported through five-year renewable grants. In the third approach, the panel was concerned with instruction in theory development. As a final approach, the panel identified a group of individual studies aimed at five specific, delimited needs, both for promoting progress across other approach categories and for dealing with other isolated but critical issues. (BD)

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NIE CONFERENCE ON STUDIES IN TEACHING

PANEL 10

THEORY DEVELOPMENT

GOAL STATEMENT

To advance the development of theory that improves understanding, prediction, and control of phenomena in the teaching process and their antecedents and consequences.

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Washington, D. C.

May, 1975

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PREFACE

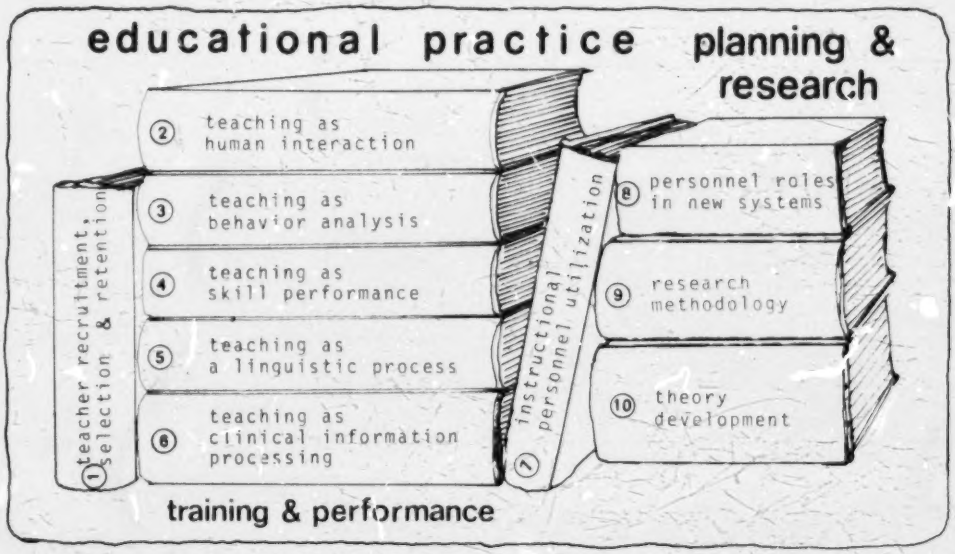
The volume before you is the report of one of ten panels that participated in a five-day conference in Washington during the summer of 1974. The primary objective of this Conference was to provide an agenda for further research and development to guide the Institute in its planning and funding over the next several years. Both by the involvement of some 100 respected practitioners, administrators, and researchers as panelists, and by the public debate and criticism of the panel reports, the Institute aims to create a major role for the practitioner and research communities in determining the direction of government funding.

The Conference itself is seen as only an event in the middle of the process. In many months of preparation for the Conference, the staff met with a number of groups--students, teachers, administrators, etc.--to develop coherent problem statements which served as a charge to the panelists. Panel chairmen and others met both before and after the Conference. Several other panelists were commissioned to pull together the major themes and recommendations that kept recurring in different panels (being reported in a separate Conference Summary Report). Reports are being distributed to practitioner and research communities. The Institute encourages other interest groups to debate and critique relevant panel reports from their own perspectives.

The Conference rationale stems from the frank acknowledgment that much of the funding for educational research and development projects has not been coordinated and sequenced in such a way as to avoid undue duplication yet fill significant gaps, or in such a way as to build a cumulative impact relevant to educational practice. Nor have an agency's affected constituencies ordinarily had the opportunity for public discussion of funding alternatives and proposed directions prior to the actual allocation of funds. The Conference is thus seen as the first major Federal effort to develop a coordinated research effort in the social sciences, the only comparable efforts being the National Cancer Plan and the National Heart and Lung Institute Plan, which served as models for the present Conference.

As one of the Conference panels points out, education in the United States is moving toward change, whether we do anything about it or not. The outcomes of sound research and development--though enlisting only a minute protion of the education dollar--provide the leverage by which such change can be afforded coherent direction.

In implementing these notions for the area of teaching, the Conference panels were organized around the major points in the career of a teacher: the teacher's recruitment and selection (one panel), training (five panels), and utilization (one panel). In addition, a panel was formed to examine the role of the teacher in new instructional systems. Finally, there were two panels dealing with research methodology and theory development.


educational practice
planning & research
② teaching as human interaction
③ teaching as behavior analysis
④ teaching as skill performance
⑤ teaching as a linguistic process
⑥ teaching as clinical information processing
① teacher recruitment, selection & retention
⑦ instructional personnel utilization
⑧ personnel roles in new systems
⑨ research methodology
⑩ theory development
training & performance

Within its specific problem area, each panel refined its goal statement, outlined several "approaches" or overall strategies, identified potential "programs" within each approach, and sketched out illustrative projects so far as this was appropriate and feasible.

Since the brunt of this work was done in concentrated sessions in the space of a few days, the resulting documents are not polished, internally consistent, or exhaustive. They are working papers, and their publication is intended to stimulate debate and refinement. The full list of panel reports is given on the following page. We expect serious and concerned readers of the reports to have suggestions and comments. Such comments, or requests for other panel reports, should be directed to:

Assistant Director
Program on Teaching and Curriculum
National Institute of Education
1200 19th Street, N. W.
Washington, D. C. 20208

As the organizer and overall chairman for the Conference and editor for this series of reports, Professor N. L. Gage of Stanford University richly deserves the appreciation of those in the field of teaching research and development. The panel chairpersons, singly and together, did remarkable jobs with the ambitious charge placed before them. Special acknowledgments are due to Philip Winne of Stanford University and to Arthur Young & Company for coordination and arrangements before, during, and after the Conference. But in sum toto, it is the expert panelists--each of whom made unique contributions in his or her respective area--who must be given credit for making the Conference productive up to the present stage. It is now up to the reader to carry through the refinement that the panelists have placed in your hands.

Garry L. McDaniels
Program on Teaching and Curriculum

LIST OF PANEL REPORTS AND CHAIRPERSONS

1. Teacher Recruitment, Selection, and Retention, Dr. James Deneen, Educational Testing Service
2. Teaching as Human Interaction, Dr. Ned A. Flanders, Far West Laboratory for Educational Research and Development
3. Teaching as Behavior Analysis, Dr. Don Bushell, Jr., University of Kansas
4. Teaching as Skill Performance, Dr. Richard Turner, Indiana University.
5. Teaching as a Linguistic Process in a Cultural Setting, Dr. Courtney Cazden, Harvard University
6. Teaching as Clinical Information Processing, Dr. Lee S. Shulman, Michigan State University
7. Instructional Personnel Utilization, Dean Robert Egbert, University of Nebraska
8. Personnel Roles in New Instructional Systems, Dr. Susan Meyer Markle, University of Illinois
9. Research Methodology, Dr. Andrew Porter, Michigan State University
10. Theory Development, Dr. Richard Snow, Stanford University

- Conference on Studies in Teaching: Summary Report, Dr. N. L. Gage, Stanford University

INTRODUCTION

The history of western science shows that theory development is the best and most efficient means of advancing knowledge and control of natural phenomena. In education, however, and particularly in the study of teaching, research and practice often appear devoid of theory. At least, it is fair to say that the theories guiding research and practice here have remained largely implicit, unformalized, and unclear. Theoretical work has not yet become a major activity of educational researchers working on the study of teaching. This condition is perhaps understandable, given the relatively short period during which systematic and programmatic research has been pursued and supported in the United States.

Through the second quarter of this century, and particularly during the past two decades, however, diverse research efforts have produced scattered arrays of empirical findings. As research findings have accumulated, there has been an increasing need to organize what has been learned into theoretical form. And, there is increasing need for this research to be guided by, and toward, theoretical issues. Theories are useful well beyond their role in structuring knowledge, or the pursuit of knowledge, for its own sake. They are not the esoteric playthings of academicians. They package accumulated knowledge for dissemination and application in further research and, perhaps more important, in practice. In education, theory may provide the best, most efficient means of translating research into practice. Teachers and teacher trainers do not apply research evidence directly; they apply theories that make research evidence understandable and usable. And theory can also be a medium of communication from teaching practice to research.

Thus, improved theories will help define, organize, and guide continuing research. They will provide vehicles for carrying research to practice and practice to research, for the examination and improvement of each. And they will serve as well the systematic planning and funding efforts of NIE.

Goal Statement

The goal as formulated and formally articulated in the goal statement is to:

> Advance the development of theory that improves understanding, prediction, and control of phenomena in the teaching process and their antecedents and consequences.

This is an awesome goal. While the Panel had no difficulty in adopting this statement of the ultimate goal, members did express doubt that a small panel in a four-day conference could make really significant headway on the broad front implied by the statement. Given these limits, the Panel agreed that it should concentrate on the ways and means of advancing theory development in general, and in the abstract, rather than on the substantive problems of theory development in any particular area of research on teaching. Theoretical issues in any particular area of research on teaching would best be left to the consideration of the relevant substantive panels. The Panel also chose not to spend time elaborating the case in favor of attention to theory, or the definition of what does and what does not constitute a theory. For a strong argument in favor of emphasis on theory in educational research, see Suppes (1974). An opposing view has been stated by Glass (1972). Discussion of definitional issues is available in Turner (1967), Kaplan (1964), and Snow (1973).

The act of making theory is a creative human behavior, influenced by forces within the individual theorizer and by the social, cultural, economic, and political context within which the theorizer works. The act itself, and the processes that influence it, are themselves open to systematic philosophical and scientific analysis. Such analysis may be the best means of discovering and inventing the ways in which improved theory construction, and hence improved theories, can be obtained.

The Creative Act of Theory Construction: Some Issues

Scientific creativity has often been a topic of learned discussion. There have been armchair descriptions of the steps involved in building and testing theories and in human problem-solving in general. There has also been psychological research on the correlates of creativity in theoretical work.

Little is yet known, however, about predicting or fostering creative theory development among researchers. On the assumption that those who themselves are distinguished for their scientific creativity know best how to advance it, a meeting of some of the world's more prominent scientists and philosophers of science was held recently in West Germany. (See Science, June 21, 1974, vol. 184, p. 1273; full proceedings to appear in Excerpta Medica.)

Selected quotations from the Science report on this meeting, by T. H. Maugh II, will help describe the problem area faced by this Panel, and connect it to the general problem faced by all who are charged with the goal of "advancing the development of theory . . . ."

"More than 90 percent of scientific innovation, it is frequently argued, has been accomplished by fewer than 10 percent of all scientists. This situation presumably exists because only a few scientists have creativity--that ill-defined state of mind which allows the investigator to forge anomalous or apparently unrelated facts into bold new chains of theory. The pace of innovation could certainly be increased to meet pressing technological [and educational, and other social] problems if the number of creative scientists could be increased, but how to accomplish this feat remains a very difficult problem. Is it, in fact, possible to teach creativity? Is it possible even to create conditions that nurture preexisting creativity? Or is it possible only to expand the number of practicing scientists in the hope that the percentage of creative scientists will remain constant?

" . . . The conference . . . [was] less productive than its sponsors might have hoped. The assembled group was able to agree on many innate characteristics that contribute to creativity--characteristics that would be readily recognized by anyone familiar with the vast literature about creativity--but it did not reach any consensus about what might be done to enhance these characteristics.

"Perhaps the principal problem, as Leon Eisenberg pointed out . . . is that the scientist who attempts to explain in retrospect how he developed a creative idea is only rationalizing a series of events that he thinks might have happened. . . . Innovation is, for a majority of people, essentially a preverbal process; . . . translating that thought process into words almost certainly alters the perception of the process. Many conclusions drawn from this verbal reconstruction of the creative process may be incorrect if the reconstruction is itself faulty.

" . . . A major element in scientific success is the ability to distinguish between ideas and good ideas. Creativity, suggested Sir Karl Popper, can be divided into two stages--obtaining ideas and criticizing those ideas to determine which are worthless and which are worthwhile. . . . The ability to generate ideas is the innate part of creativity that probably cannot be altered, while the development of a critical faculty is the essential part of creativity that can be nurtured through education. Failure to develop this faculty, argued Gustav Born, is one of the major causes of scientific sterility. . . .

"And how is this creative facility developed? Generally, most of the participants agreed, through the master-apprentice relationship that arises from working with a successful scientist.

> "But few young scientists are able to enjoy the luxury of working and associating with Nobel-quality scientists. What then can be done to help them develop this necessary critical faculty? Most of the conference participants argued . . . that 'creative science' could not be taught in universities. Many . . . spoke derisively of . . . teaching courses in creative writing, suggesting that it is not possible to teach creativity in any subject.
>
> " . . . [But] most such courses are actually teaching criticism of creative writing. That is, the instructor . . . [assumes] that the students have some creative writing ability, then teaches them how to distinguish good writing from bad writing, how to avoid making certain types of mistakes in writing, and how to avoid the banal and the trivial. The analogy to creative science is straightforward and, though the application of the concepts may be somewhat more difficult than is the case with creative writing, the benefits that might be derived from this type of education in science could be far greater." (Maugh, 1974)

We draw from these remarks and from our own panel discussion at least four kinds of issues involved in the problem of advancing theory development.

1. Despite centuries of theory development in science, the process of theory construction and the means of promoting it are not well understood. There are relatively few creative theoreticians in established sciences, and fewer still in new areas of research such as education.

2. The impression is strong that theory development is, at its base, the product of hard, solitary, cognitive work by individuals, not by groups, programs, systems, or other organized collectivities, and that individuals differ in innate creative potential for theoretical work. There is considerable doubt that theoretical productivity can be improved by education or training. Yet there also is no solid evidence that it cannot be advanced by organized learning of some sort. Parts of the process appear to have been learned in the past by imitation in master-apprentice relationships. Awareness of theoretical issues and attitude toward theoretical work, as well as critical facility, seem to be learned. Some ideas and analogies from other fields can serve as models for instructional attempts. And some other mechanisms for facilitating theoretical work seem promising enough to be worthy of trial.

3. Advancing theory in education is an especially complex problem because of the complexity of educational phenomena. All that is known about human behavior is potentially relevant to behavior in the educational realm. And educational phenomena seem to have unique or emergent properties requiring a kind of theory not derivable directly from behavioral and social science.

4. Theories in education, and particularly theories of teaching, need ultimately to be both descriptive and prescriptive-normative in character. That is, they need both to provide explanations of educational affairs and to indicate improvements that should be pursued. While this distinction between functions of theory has long existed in established sciences and their applied fields, nowhere is the demand for close relationship between description and prescription greater than in education today. The coordination of these two functions and the normative or value considerations that condition their form are not well understood.

DERIVATION OF THE APPROACHES: A MATRIX OF DIFFICULTIES AND MECHANISMS

Early in the Panel's deliberations it became clear that a hierarchical description of this problem area was not the most productive way to proceed. Unlike the problem of specifying substantive research in a field, the problem of theory development seemed best attacked by elaborating the various difficulties, problems, and unanswered questions that inhibit theoretical advance, and then identifying or inventing ways and means of overcoming, or at least reducing, these difficulties. Attempting a hierarchical description of this problem area seemed to interfere with this process. Thus, the hierarchical structure was set aside in favor of a facet or matrix structure in which difficulties could be crossed with mechanisms for attacking them; the Panel was less concerned as to whether the resulting cells turned out to define programs, or projects, or some of both. It was hoped that a hierarchical structure consistent with that of other panels could be reintroduced after the facet structure had served its purpose. Here, incidentally, is an example of another kind of difficulty inhibiting theory development: different structural models (or theories) can constrain or facilitate conceptual analysis of a particular problem. The contrast between hierarchical and facet structures shows them to possess different powers for different theoretical purposes.

To construct the matrix, eight difficulties that impede theory development were listed to form eight separate columns. These were stated in the form of questions. Then, nine possible mechanisms were identified that held some promise for reducing or eliminating at least one, and potentially several, of the difficulties. These formed the rows of the matrix.

Difficulties in Theory Development

The eight difficulties were stated as follows:

1. Existing theories and constructs. What theories or theoretical constructs exist for application in research on teaching and how can these be identified and selected? It is clear that there exists a wide variety of theories and constructs in social and behavioral science. Concepts are available from philosophical analyses of scientific research, of normative considerations in education, and of the act of teaching as well. Useful constructs might also be derivable by analogy from physical and natural science. These constructs can be grouped into major forms or types

of theory, or subdivided to identify key variables and relationships. Until we have some conception of the catalog of possibilities, it will be difficult to judge which lines of theory development are likely to be most useful.

2. Constraints of dominant paradigms. What constraints on new theory development are imposed by currently dominant paradigms? The Zeitgeist, or "temper of the times," the societal, philosophical, and cultural traditions, and the current fashions in research and statistical methodology, all constrain theory development. There is need for continuing consideration of these metatheoretical and methodological issues, and for critical evaluation of current programs of research, both to explicate the constraints and to identify areas of potential theory development that have previously been ignored.

3. Theory construction processes. How are theories constructed from research? from practice? from other sources? We know very little about the psychology of theory construction, or about the social, economic, and political forces that shape theory development. Without adequate understanding of these processes, we cannot hope to promote improved theory development effectively or efficiently.

4. Critical evaluation. How are good theories constructed? We need better understanding of the role of critical evaluation in theory development.

5. Applications of theories. How are theories applied in research? in practice?

6. Theories of teaching. Are unique theories of teaching necessary? To what extent can theories of teaching be derived from theories of learning or of other educational phenomena? What are the emergent or unique properties, if any, that make theories of teaching different from other theories?

7. Theoretical and technical language. How can communality, translatability, and systematization of theoretical and technical language be achieved?

8. Discovery and Rediscovery. How can we keep people from rediscovering "wheels" and "spooks" while at the same time keeping people rediscovering "wheels" and "spooks"? On the one hand, considerable theoretical resources are wasted in discovering and developing anew ideas that are old, and in pursuing ideas that are illusory, i.e., that have been disproved or are unprovable. On the other hand, sound theory development requires that considerable effort be expended in replication and generalization. And, old illusions sometimes become new facts as theory and methodology develop, and fashions change. Research on teaching needs to be made both cumulative and reflective.

Mechanisms for Resolving the Difficulties

The nine mechanisms for attacking these problems were defined as follows:

1. The "backroom" group -- working groups on comparative analysis, evaluation, and integration of theory and methodology.

2. The "loner" -- individuals selected and supported for extended programmatic work on theory development.

3. The "book of examples" -- case histories and models showing the trials and tribulations of theory development in process.

4. The "one-shot" project -- specific projects aimed at particular needs or impediments that are critical for obtaining later more general advances in theory development.

5. Courses, workshops, other formal instructional ventures.

6. NIE contracting requirements -- removal of NIE regulations and practices that inhibit theory development and institution of regulations and practices that promote theory development.

7. The research cumulator and concept history -- in effect a memory perhaps computerized and designed on the model of, or as part of, the ERIC system. The memory system would be indexed with specific concern for the needs of theoretical work.

8. The "devil's advocate" and the "itinerant preacher" -- individuals charged with the responsibility, in particular projects or whole program areas, for maintaining researchers' attention on theoretical assumptions, weaknesses, and implications of their work.

9. The periodic panel -- to do on a regular basis what our present Panel is attempting to do as a "one-shot" project. This would provide a periodic review, monitoring, and updating of accomplishments and needs with respect to theory development. Membership might be on a permanent, revolving, term, or overlapping term basis.

Reducing to the Four Approaches Selected

The 8x9 matrix formed by crossing difficulties and mechanisms served as the basis for discussion of possible programs and projects that might fit individual cells. These possible program ideas served to test how many difficulties (columns) a given mechanism might address. They also helped test the extent to which the mechanisms were independent or the difficulties were independent.

On the basis of this discussion, it was decided to focus attention on the four independent mechanisms that seemed most potent in attacking the largest number of difficulties. Thus, Mechanisms 1, 2, 3, and 4 were chosen for adoption as approaches. Mechanism 5 seemed to be combinable with 3. Mechanism 6 seemed largely beyond the purview of this Panel, though it was agreed to append recommendations to NIE on this point to our final report, time permitting. Mechanisms 7, 8, and 9 seemed less critical but deserving of further consideration at some future date, to the extent that their values could not be incorporated into our explication of Mechanisms 1, 2, 3, and 4 as approaches.

The resulting 4x8 matrix is shown in Exhibit I, with the four adopted Approaches as rows. Within each approach, one or more programs or projects are defined. In keeping with the Panel's lesser emphasis on the hierarchical structure, no firm distinctions were drawn between a "program" and a "project"; the Panel often used the term "program/project." Nor did the Panel try to limit such a program/project to a single cell of the matrix. The identifying number for each program or project appears in only one row (Approach) but in all columns (difficulties) on which it bears. An asterisk denotes the cell to which each program/project is primarily addressed. These program/projects will be discussed below, under presentation of adopted Approaches.

EXHIBIT I

Difficulties in Theory Development

Mechanisms (Approaches)	What theories and constructs exist? How select for study?	What constraints on theory development imposed by current paradigms?	How are theories developed from research? practice? other?	How are good theories constructed?	How are theories applied in research? in practice?	Are unique theories of teaching necessary?	How to systematize theoretical and technical language?	How to keep people (from) rediscovering "wheels" and "spooks"?
"Back-room groups" -- Working groups on comparative theory and methodology 10.1		10.11*		10.11	10.11		10.11	10.11
"Loners" -- Individual programmatic theory development 10.2		10.21 10.22	10.21* 10.22 10.23 10.24 10.25	10.23 10.25	10.25	10.23* 10.24		10.21 10.22
"Book of examples" -- Instruction in theory development 10.3			10.31* 10.32		10.31 10.32*			
"One-shot" projects on particular short-term needs 10.4	10.41 10.42* 10.43 10.44		10.41 10.43		10.41* 10.43*		10.45*	10.45

AN ILLUSTRATIVE LISTING OF THEORIES, CONSTRUCTS, AND DISTINCTIONS

Before describing the adopted Approaches and program/projects, the Panel chose to try an initial enumeration of some of the existing theories, constructs, and distinctions between theories. This exercise would serve as an example of how one might attack the "first column-difficulty" using the "fourth row-approach." It would help define one program or project (ultimately 10.42), sharpen our ability to specify other projects, and provide a suggestive listing of theories that readers of this report might elaborate upon. The Panel thus served as a miniature, one-shot project (costing six person-hours).

The list appears in Exhibit II. Clearly, the list is not exhaustive. We have not taken time to elaborate the many normative and value concerns that deserve attention, or to list concepts from curriculum theory. In general, we have also not included examples of theory from sociology, economics, physiology, biochemistry, and neuropsychology, because the Panel lacks expertise in these areas. But much more clearly needs to be added. Individual theories identified here with only a simple label could be subdivided to show their particular network of theoretical concepts and constructs. These could then be examined as to their applicability to each of a variety of problems and roles in teaching, again using a matrix arrangement. Then, the relevance and requirements for improving theory in each domain could be examined. Theoretical constructs could be connected to specific teaching problems, and perhaps accumulated to form eclectic, but new, networks of theory worthy of research. It is clear that the complexity of teaching and the variety of theoretical approaches insures that no one or two theoretical approaches will suffice in research on teaching or in the practice of teaching. And theories will be judged in terms of their usefulness in research and practice, not in terms of their truthfulness in some absolute sense. No one grand theory of teaching will be possible; so eclectic use of constructs plucked from different theoretical frameworks and applied in delimited teaching situations may be the best way of advancing theoretical development.

We could create a second dimension, crossed with this list of theories, by listing teacher roles, e.g., skill performance, Kulturtrager (carrier of culture), manager, linguistic processor in a cultural context, social model, intellectual model, decision-maker, counselor, or clinician. Or we could list teaching problems, e.g., choosing materials, planning lessons, adapting to student differences, leading discussions, tutoring, critiquing student work, etc. This list could easily become as long as that shown in Exhibit II.

EXHIBIT II

A List of Theories, Categories, and Distinctions among Theories

1. Scope of Theory: Complete theory vs. "middle-range" theory vs. miniature theory -- mathematical models might be examples of miniature theory.

2. Descriptive vs. Prescriptive-Normative Theories. Bruner and Dewey might be called prescriptive theorists. One might also argue that a theory should reflect the convictions of the theoretician (i.e., be normative).

3. Theories from Outside of Teaching (e.g., behavioral science theories) vs. Theories Arising from Consideration of the Teaching Act.

4. Static vs. Dynamic Theories. Evolutionary capability must be in theory. Behavioral science theory is often not dynamic. For example, the theories of Skinner, Tolman, etc., are static.

5. Relevant vs. Irrelevant Theories. If a theory is apparently "foreign to the world of teaching," it can still serve a function. What is irrelevant to one person may be relevant to others. A theory can fit one situation with one kind of student, and not other situations and other kinds of students.

6. Categorization of Levels of Theory

   Axiomatic Theory -- Highly formal. R. C. Atkinson (1972) approaches this level in his miniature theory of instruction.

   "Broken" Axiomatic Theory -- Eclectic collections; this may be an empty set at present.

   Conceptual Theories -- J. W. Atkinson's theory of need achievement (Atkinson & Feather, 1966), psychoanalytic theory, any network of constructs.

   Taxonomies -- Guilford's (1967) structure of intellect; Gagné's (1970) types of learning.

   Elements -- Any attempt to isolate components without elaborating inferences or theoretical networks; Skinner's reinforcement concept may be an example.

7. Functions of Theory

   To guide practice (including socio-political functions).

   To systematize or explain existing data.

   To guide research. One goal is to have a theory that is empirically testable. But some theories are useful (i.e., guide practice) even though they are not testable.

EXHIBIT II

(Continued)

8. Behavioral and Social Theory

Conditioning
Continuity theory
Hullian theory
Tolman's theory
Estes' statistical learning theory
Kohlberg's moral development theory
Achievement motivation theory
Guilford's theory of abilities
Cattell's ability theory
Cattell's personality theory
Piagetian cognitive development theory
Bandura's observation learning theory
Festinger's dissonance theory
Heider's balance theory
Kelley's attribution theory
G. Allport's theory of individuality
F. Allport's theory of enestruence
Murray's personalogical theory
Maslow's and others' humanistic theory
Role theory
Lewinian field theory
Rogerian theory of counseling and psychotheraphy
Psychoanalytic theories (Freud, Jung, Adler, etc.)
R. C. Atkinson's theory of optimization of learning
Mathematical learning theories
Mathematical social theory (March, Coleman)
Organization theory
Information processing theory (various models of attention, learning, memory, problem solving)
Gagné's hierarchies
Carroll's model of school learning
Bloom's master learning
Bruner's developmental theory
Bruner's instructional theory
Ausubel's cognitive theory
Dahllöf-Lundgren-Kallós frame factors
Probabilistic functionalism--Brunswik, transactionalists
Miller-Dollard learning theory
Harlow error-factor theory
Etc.

9. Physical and Natural Science Theory by Analogy

Ethological adantation
Linguistic theory
Information theory
Cybernetics
Control theory
Systems theory
Linear frequency theory
Maccia's analogies
Etc.

10. Normative Theories

Marxian dialectic
Dewey
Montessori
Joyce-Weil models
Lonergan insight
Polanyi
Etc.

11. Other Concepts and Constructs given by more than one theory or emerging from current research

Intrinsic vs. extrinsic reinforcement
Association by imagery
Developmental level--temporal stacking
Learning by imitation without reinforcement
Individual differences in learning abiiity
Aptitude-instructional treatment interaction
Cognitive styles
Learning environments
Teacher expectancy
Other lists of applicable psychological principles (See, e.g., Hilgard & Bower, 1966)
Etc.

There is also a third general dimension, namely, the methodology, operations, and forms of evidence needed to examine each intersection of a theoretical construct and a teaching role or problem. We cannot elaborate this dimension now; clearly there is here a need to coordinate with Panel 9, on Research Methodology, on devising means of studying each theory-problem interaction considered worthy of research.

As further groundwork toward such efforts as those mentioned above, the Panel began accumulating a working bibliography on theory construction for studies in teaching. However, the bibliography was not completed, and has not been included here.

APPROACH 10.1

FORM WORKING GROUPS FOR THE COMPARATIVE ANALYSIS, EVALUATION, AND INTEGRATION OF THEORY DEVELOPMENT

This Approach is needed to provide a continuous, in-depth attack on the difficult issues of comparing, evaluating, and integrating theoretical and empirical work arising from individual projects in the field. No single project or "one-shot" study will provide the sufficient level of intellectual effort needed to reach general theoretical improvement. It is also unlikely that individuals working singly will have the variety of perspectives and competencies required. Hence, this Approach would form one or more relatively permanent working groups of specialists in the social-behavioral sciences, education, and philosophy. These we refer to for ease of identification as "backroom groups." The purpose of these groups would not be to develop theory in any one substantive area, but to do comparative and evaluative work on the metatheoretical and methodological issues constraining theory development at the primary level of research work (as done by "frontroom" researchers).

The basic objective of this Approach is to provide the field with an independent panel that has wide knowledge of theories, theory development, theory comparison, and methodology -- a panel that can review, comment on, and integrate the existing literature. More specifically, this panel would:

- Provide a continuing, independent source of review for projects involving the construction, application, and evaluation of theories relevant to teaching.
- Provide an accumulative reflective function to help (a) guide researchers away from wasteful rediscoveries, (b) emphasize the need for replication and re-examination of existing concepts where appropriate, and (c) promote the development of theory in neglected areas, forms, or situations.
- Study the process of developing and applying theory in research and practice by reviewing examples, with a view to developing generalizations and guidelines.
- Provide a continuing study of existing traditions of approach and methodology that constrain or condition theoretical constructions.

- Provide a mechanism for communicating and translating theories and research findings across projects involving different scientific disciplines and technical languages.

This Approach is represented by one program/project. In effect, the Approach is the program is the project.

Program 10.1.1: Form Working Groups for the Comparative Analysis, Evaluation, and Integration of Theory Development.

Current knowledge or activity at this level is essentially nonexistent. The effort of a National Academy of Education committee (Cronbach & Suppes, 1969) represents one step toward one part of what is needed in this area. No one is examining mismatches between theory and research, between theory and practice, and among theories in different areas of work; nor is anyone providing discussion of these issues for the guidance of research. At this level of generality, no analyses of observation languages, data bases, and interpretive frameworks are being conducted. Nor is there presently any mechanism which would facilitate such work, which is fundamental to all other activities in the problem area of this Panel. The setting up of such a group as the one suggested is the best mechanism our Panel can think of to meet this need. Although the ultimate degree of success is uncertain, the Panel considers the probability of significant impact on the field to be extremely high.

One possible action plan for implementing this recommendation is as follows:

1. Select eight experts in areas of educational theory and research, social-behavioral science theory and research, and philosophy.

2. Decide whether the program should be organized as two projects (education specialists, science specialists) or as one combined group.

3. Decide on mechanism for regular interaction. (A seminar every summer plus one full year together is recommended.) Also, decide a means for including guest experts from the arts, the humanities, and the teaching profession (e.g., Koestler, Polanyi).

4. Develop and disseminate integrative reports and analyses. (Dissemination funding should be assured by NIE.)

Because of its potentially overarching relationship to the entire field of educational research, the Panel is suggesting a five-year renewable grant for such an enterprise. Monitoring would be through a periodic review of productivity, as well as a periodic survey of the effects on research (especially research on teaching),

but with no specification of particular products in advance. Illustrative projects that could be undertaken would include:

- Comparative analysis of methodological constraints on theory development
- Comparative analysis of interpretive frameworks, observation schemes, languages, and data bases
- Comparative analysis and evaluation of theories applied to research and practice
- Comparative analysis of prescriptive and descriptive forms of theory

APPROACH 10.2

STIMULATE PROGRAMMATIC THEORY DEVELOPMENT BY INDIVIDUALS

This Approach is premised on the observation that primary theory development in a substantive field requires long, hard work by a researcher working alone, without short-term stipulations as to schedule and productivity. The individual theoretician may derive great benefit from close contact with data other than his or her own, and may obtain ideas and criticism from an invisible college of researchers sharing common goals. But all the examples of great theory in the history of science show the crucial importance of solitary unconstrained intellectual work at significant points in the process. We expect that improved theory in research on teaching will not be forthcoming without provision for the support of this kind of activity. Theory development will be inhibited to the extent that all NIE-supported research programs and projects require investigators to conform closely to schedules with the exact form of product specified in advance.

We see specific needs for four program/project activities in this Approach. We also advocate a subsequent fifth program that would fund individual theorists in those substantive areas of research and practice that emerge as most ready for intensive effort at theory development.

These are: (a) the need for research on a psychological theory of theory construction; (b) the need for theories of social, cultural, economic, and political processes that promote or constrain theory development; (c) the need for philosophical analysis of the extent to which unique theories of teaching, as opposed to theories borrowed from social-behavioral science are required; and (d) the need for research on how theories are extended beyond the data they were designed to explain, and tested for utility.

Program 10.2.1: Examine the Psychological Process of Theory Construction in Relation to Research on Teaching

While some philosophers, historians, and social scientists have been concerned in the past with the process of theory construction, what knowledge we have of this process is formal, abstract, and "after the fact." Relatively little attention has been paid to this phenomenon by research psychologists. There are some case studies, but no useful generalizations and few ideas about the psychological tools and heuristic devices actually used by theorists.

There is reason to believe that the hypothetical-deductive method is not an accurate description of the actual process followed. There is, however, much psychological literature on creativity, problem-solving, and related processes. And there have been studies of theoretical scientists in the physical sciences and engineering (see, e.g., Roe, 1951, 1953; Guilford, 1967; Elduson, 1962; Torrance, 1962; Barron, 1958; and Wallach, 1967). It is not known whether the crude conceptions of theoretical processes apply or adequately explain theorizing in education or, more specifically, in research on teaching.

The objective of this program, therefore, would be to develop a theory of theorizing, with special reference to the character and needs of theoretical work in research on teaching. The successful development of such a program as envisioned here would have major impact on activities throughout the problem areas of this conference. Furthermore, nothing would be so useful in reaching NIE objectives as good theories of teaching, which would be significantly advanced if we had a good theory of theorizing.

However, the probability of such success is unpredictable. Creative theorizing is an unpredictable process, even given the choice of the evidently best person at the start of the project. The availability of such "best persons" is, moreover, uncertain. Careful attention would need to be paid to the process of selecting an individual researcher for a long-term renewable research award. Since the Panel is recommending that no external evaluation be permitted under any circumstances during the initial five-year period, the probability of success might be increased by funding two individuals to work independently on this problem. At the end of this period, with the help of advice from other theoreticians and researchers, NIE would review the accomplishments and evaluate the likelihood of continued progress in judging whether to renew the award for an additional two to five years.

Since a major purpose of the program is to construct a model of the optimal sequence of steps in theorizing, the Panel found it paradoxical to attempt to specify this sequence beforehand. One possible approach is as follows:

1. Review the matrix of relevant social-behavioral theory and teaching theories available from Program 10.4.2 and other programs.

2. Review the literature on the nature of theorizing, creativity, problem solving, thinking, and related fields, including case-history materials on creative scientists.

3. Conduct retrospective interviews, task analyses, and detailed reconstructions of the processes of scientists who have made specific theoretical contributions.

4. Develop flow charts of steps and processes, alternative routes, and heuristics used in thinking. Test adequacy of account against data from Step 3.

5. Conduct discussions with other outside experts.

6. Think and write, in alternation.

7. Return to all previous steps; stop when theory is constructed or when five years are up, whichever comes first.

Program 10.2.2: Study the Social, Cultural, Economic, and Political Processes Influencing Theory Production and Application in Research on Teaching.

We have no functionally useful conception of how theory production in the field of research on teaching is constrained by social, cultural, economic, and political forces in our society. The processes and forces operating in this domain, although partly under individual, group, and governmental control, are complex, largely unexplored, and unexplicated. There is a sociology of science (see, e.g., Merton, 1957; Barber & Hirsch, 1962) which contains concepts and ideas of value in understanding this complex domain, and there may be administrative policy studies relevant to their control. But no one has systematized this knowledge or pursued its elaboration, particularly in educational research. It is likely that a social model (see, e.g., March, 1970) could be constructed to represent these complex forces.

Successful work in developing such systematized theory would have major impact on other activities in the problem area of this Panel, since it would permit increased control of the forces that inhibit theory construction in other areas. As in Program 10.2.1, however, creative progress is difficult to predict, and careful attention would need to be paid to the process of selecting a suggested team of three individual researchers for a long-term five-year renewable grant. As with Program 10.2.1, also, the Panel is recommending that no external evaluation be permitted during that period. The suggestion for a three-man team, however, increases the likelihood that at least one will be highly productive and that portions of useful theory will be produced.

The suggested sequence of activities is as follows:

1. Review the literature on related social, economic, political, administrative, and policy issues.

2. Conduct interviews, surveys, and analyses of archival data.

3. Build mathematical models and related verbal-theoretical accounts of the processes and forces under examination.

4. Test the results from Step 3 against the data from Step 2.

5. Think and write, in alternation.

6. Conduct discussions with other experts.

7. Return to all previous steps; stop when theory is constructed or when five years is up, whichever comes first.

Program 10.2.3: Make a Philosophical Analysis of the Need for Theories Unique to Teaching

If there were good reason to believe that social and behavior science theory could completely describe and explain teaching, then searches for some unique theory of teaching would not be necessary. Conversely, if no general theory will suffice, then the search for theory unique to teaching assumes increased fervor. If this question could be settled (and it needs full and serious consideration), the result would have great impact on the direction and mode of research on teaching -- especially if we thereby discerned what was gained or lost as a consequence.

The question of whether a set of theories unique to teaching is required has been raised in a general way in philosophy of education (see, e.g., Gowin, 1972) and in a preliminary way by some researchers (e.g., B. O. Smith), but no focused and concerted effort has been made to reach closure. If such an effort were seriously made, a more sophisticated theoretical understanding of related social, behavioral, and educational phenomena would result and help researchers to answer the questions, even in the absence of complete closure.

This program would bring together some of the best theoretically minded philosophers and researchers to write and respond to papers, to debate this central issue, and to disseminate the results. The suggested sequence of events is as follows:

1. Identify potential contributors to a conference on the "uniqueness" of theory and research on teaching.

2. Develop a "problem" statement to guide the preparation of papers by contributors (1-3 months).

3. Receive drafts of papers and assign respondents (9-12 months).

4. Hold conference.

5. Disseminate proceedings.

Program 10.2.4: Extend Current Theory to Other Domains and Test Its Utility in These Domains

The means by which theories are extended beyond the domain for which they were intended are unclear. Methods of testing theories for generality and applicability are incompletely specified and unsystematic. Philosophers and scientists have specified criteria for judging the adequacy of theory (see Turner, 1967; Kaplan, 1964; Zetterberg, 1954; and Gordon, 1968; and summary in Snow, 1973). But more detailed examination and elaboration of these criteria are required, along with more careful theoretical and empirical study of the theory extension and testing process. The methods and tools for translating theories and models to other domains remain unclear and uninvestigated.

The focus of this effort, then, would be to develop methods and tools for extending and translating theories into other domains, and for testing their adequacy in such new applications.

The Panel suggested the selection of two individuals to work singly and in combination, each with a long-term research award. Although substantial knowledge on parts of the problem are already in hand, the Panel recommended no evaluation during the interim five-year period. The suggested plan of action during that period is:

1. Review literature on methods and tools for theory extension and evaluation.
2. Identify case studies.
3. List criteria and methods.
4. Apply criteria to case studies; identify methods used in case studies.
5. Design studies to explore fringes of applicability for each of several theories.
6. Independently obtain critique of 3 and 5.
7. Disseminate cases, criteria, methods, and research designs.
8. Return to 1; stop when five years is up.

Program 10.2.5: Make Awards for Individual Research in Particular Intersections of Theory and Practice

Too little of educational research is based on theory, and too few attempts to apply middle-level theories to education have been

made. Some examples of successful application have been J. Atkinson's work in achievement motivation (Atkinson & Feather, 1966) and N. Miller's application of learning theory to filmed instruction (1957). Skinner's operant theory has given rise to classroom applications, though it was originally based on pigeon and rat data. We have had few applications of theories from disciplines other than psychology, and we need the fresh and varied interpretations of teaching that could be provided by individual theorists in these other areas, as well as other promising areas of psychology. Once particular theories are seen as relevant to particular teaching functions, there will be a clear need for individual work applying the theory to research on a particular problem. Applications of theory to substantive areas are crucial for the further development of theory and the intelligent guidance of practice.

The objective of this program would be to obtain the time and attention of theoretically-oriented researchers so that theory would be developed and applied directly to an educational area. While such theoreticians are few, some could probably be obtained for projects of this sort. The Panel felt that a program of this kind was critical to the development of theoretical research on teaching; the program would support NIE objectives concerned with producing, maintaining, and utilizing educational personnel. Funding would be in terms of two- to five-year grants subsequent to the initiation of Programs 10.4.2 and 10.4.4. The individual theorists would presumably spend most of their time in Step 3 of the following 5-step process (the first two steps being those of the funding agency):

1. Review matrix of theories (Program 10.4.2) and relevant writings of the panels described in Program 10.1.1.

2. Select individual theorists for particular areas of teaching.

3. Observe; think and write, in alternation; conduct research as needed.

4. Write and disseminate theory.

5. Return to Step 3 until the two- to five-year period is up.

APPROACH 10.3

FOSTER INSTRUCTION IN THEORY DEVELOPMENT

It may be premature to consider broad approaches aimed at instructing researchers and teachers in theory development. And there is some uncertainty about whether it is even possible to provide useful training and instruction. Certainly this approach cannot be pursued until our understanding of and research on theory development is advanced well beyond its present state. However, some instructional mechanisms can be imagined at this point. It could be extremely useful to have examples -- case studies of theory development in process and perhaps also of theory in application. Ultimately, it may be possible to design a course of instruction dealing with theory construction analogous to the courses in research methodology given today.

The basic purpose of the two program/projects in this Approach is to provide the prospective theorizer, either researcher or practitioner, with a better understanding of examples of theory development processes and the choices and difficulties faced in such development. These program/projects, one aimed at the needs of researchers, the other at the needs of teachers, are specified below.

Program 10.3.1: Develop a Manual of Theories and Theorizing for Researchers.

Program 10.3.2: Develop a Manual of Theories and Theorizing for Teachers.

The two programs proposed in Approach 10.3 are seen as complementary and compatible efforts to develop products that serve the same functions with respect to two groups: researchers and teachers. Because the output of the two programs is the same except for their target audiences, the Panel has treated both programs together.

There is a lack of awareness of the value of theories for guiding research and evaluating research findings and classroom observations. As far as we know, there is no manual available to teachers, researchers, and teacher trainers which exposes them to the nature of theories and argues persuasively for the role of theories and theorizing in organizing research and understanding classroom phenomena. One paper (Uprichard, et al., 1972) pointed out the need for and described a conceptual framework to aid researchers to identify, classify, and quantify factors relevant

for studies of instructional processes. The aim and content of this paper constitutes part of that covered in the proposed manual which, however, would be broader and deeper in scope.

Aside from serving to sensitize teachers, researchers, and teacher trainers to the role of theory and theorizing in organizing research and understanding classroom phenomena, the manuals would also promote theoretical teaching and theory-oriented research. While the program is largely independent of the remainder of the theory development effort proposed by the Panel, parts of the manual would profit from the information being developed by several programs in Approach 4.4. The suggested sequence of events is as follows:

1. Literature search.
2. Conceptualization of overall approach and outline.
3. Organization of chapters.
4. Development of chapter outlines.
5. Consulting with appropriate outside experts on the adequacy of Steps 1-4.
6. Writing chapters.
7. Formative evaluation of draft material plus evaluation of the extent to which the manual should be a single volume or one for teachers and one for researchers.
8. Proofreading, editing.
9. Publishing.
10. Dissemination.

APPROACH 10.4

CONDUCT ONE-SHOT STUDIES ON DELIMITED NEEDS

The Panel identified several specific needs that should be met to promote progress in other Approaches and to deal with other isolated but critical issues. These seemed best addressed by delimited one-shot projects.

These projects would cover the following objectives:

- Provide for the identification of the implicit and explicit theories used by teachers in practice, including analysis of commonsense constructs (10.4.1).
- Develop a matrix in which existing theories and constructs from the behavioral and social sciences would be crossed with teaching roles and problems, and with methodologies appropriate for the study of theory-problem intersections (10.4.2).
- Provide for collation and analysis of studies of research on teaching to make explicit the current theoretical bases (10.4.3).
- Provide for studies to determine the values implicit in various theoretical constructs, and the values of researchers that lead to these theories (10.4.4).
- Provide for analyses of the communality and translatability of various theoretical and technical languages (10.4.5).

Program 10.4.1: Identify Implicit Theories of Teachers.

We have little systematic knowledge of how teachers use theories in classrooms (or what theories they use). Such knowledge is needed in all other programs of this panel and, we suspect, in all other panels concerned with the classroom behavior of teachers. Some theories with which teachers may work have been noted by Joyce and Weil (1972) and Holt (1964), but this area has not been subjected to systematic observation.

The proposed program would identify and classify theories teachers use in practice, in order to aid theory construction relevant for classroom use and research, and to understand how better to arrange for the application of theory in practice. The research would

also clarify the relationship of theory to practice, identify sources and families of teaching strategies, and make possible the validation of specific teaching practices.

The following sequence of events is anticipated:

1. Pilot work on conception and methodology (e.g., interviewing, analysis of teacher diaries, and videotape sampling and analysis).

2. Representative sampling of teachers.

3. Data collection and analysis.

4. Interpretation.

5. Recycling of Steps 1 through 4 to point of redundance (lack of novelty) and diminishing returns.

6. Appropriate dissemination to other programs and projects.

Program 10.4.2: Develop a Matrix Representing Basic Constructs from Behavioral and Social Theories, Their Operations, and the Applicability to Teaching Functions

Theory for research on teaching is diffuse, coming from many disciplines which have little contact with each other. Sociologists, ethologists, and psychologists, for example, approach the same phenomena with different frames of reference. There is no good framework of knowledge about the variety and utility of different theories and their relationship to teaching functions.

This program provides a basic starting point for all of the other Approaches and programs of this Panel, and could be similarly useful as a starting point for other panels. The program would constitute a first step toward fostering the identification of theory that can guide research on teaching, much of which is now atheoretical or of limited explanatory power.

Researchers on teaching need to be aware of how theory can illuminate particular areas of teaching, and of what theoretical constructs have and have not been studied in relation to particular teaching problems. A matrix cataloguing and displaying these coexistent views of reality, and the teaching functions to which they are potentially applicable, has not been attempted. There is also need to understand the operations that tie the constructs to the behavioral phenomena under study. The methods needed for studying each construct in relation to each problem would form a third dimension.

The specific objective of the program, then, would be to catalogue (a) theories and their pivotal constructs, (b) the domains of potential and empirically verified application of the constructs to teaching functions, and (c) the operations and methods for defining the constructs and their relationships among each other and with reality.

The critical references for knowledge about this area and this approach are found in the literature on philosophy of science (e.g., Schlick, 1938) and methods of scientific proof (e.g., Bridgman, 1927; Dewey, 1938), as well as throughout the theoretical literature of social and behavioral science. Exhibit II presented earlier in this report provides an initial listing of theories and constructs.

The Panel noted that this program would be a difficult effort requiring patience, wide interests, and analytic minds on the part of the research staff. Thus the initial problem would be that of locating a project leader of sufficient breadth and credibility who will take on the job of developing the matrix.

The steps envisaged for this program are identified as follows:

1. Collect and study relevant social and behavioral theories; determine the procedures for theory inclusion and exclusion.

2. Catalogue pivotal constructs from relevant theories.

3. Define operations linking constructs to each other and to reality; cull redundant constructs.

4. Define the domain of teaching functions.

5. Theorize and examine the literature on whether or not particular constructs have utility for interpreting and predicting phenomena.

6. Exemplify the usefulness of the matrix through empirical application to a sample of real situations.

7. Disseminate research findings.

It is estimated that the first three steps, running partly concurrently, would occupy approximately two years; the next two steps, also partly concurrent, would take a further two years; and the last two steps would complete the fifth (and final) year.

Since the outputs of the individual steps would be useful in themselves, the program's efforts should be evaluated by an interdisciplinary team at the end of each step. In addition, however, the Panel believes that the program outcomes, through intellectual

imperative and demonstrations of usefulness, will guide subsequent theory and research to a sufficient degree to promote theoretical concerns in research on teaching. Therefore, the Panel recommends that an evaluation on whether such an increase in theory-based and theory-oriented research on teaching has in fact taken place should be made five years after the completion of the program.

Program 10.4.3: Collate and Analyze Theories Used in Studies of Teaching.

At present there is little knowledge about whether research on teaching is guided by grand, middle-level, or low-level theory; about whether functionalistic, inductive, or hypothetical-deductive theory building is taking place; about whether model building is restricted to a very small area of instruction; or about whether unique theories or theories borrowed from other disciplines are applied to the phenomena of interest.

This program would be aimed at increasing information about which theories currently are used in research on teaching. By making explicit the theoretical underpinnings of current research on teaching, researchers will learn which theories are guiding research, which theoretical positions are not in favor, and whether the theories in use are unique to teaching or are applications of other social and behavioral theories.

This is seen as a two-year effort, which should be concurrent with and feed into Program 10.4.2, and could possibly be combined with that program. A panel of experts would judge the usefulness of the analytic scheme at the end of the first year. The sequence of events is projected as follows:

1. Collect a large sample of current studies in research on teaching.

2. Analyze the studies for their constructs and theoretical ties.

3. Categorize constructs, theories, and phenomena examined.

4. Disseminate findings and recommendations.

Program 10.4.4: Identify the Values Implicit in the Practices of Research Workers in the Field of Research on Teaching.

It is difficult to find in the research any substantive focus on the issue of the values implicit in the practices of researchers. Some attention has been focused on the effects of the norms of educational research (Hoetker & Ahlbrand, 1969). In addition, some

observation studies have examined the values implicit in the practices of teachers (Khan & Weiss, 1973). These references might be used as a starting framework for this program.

The specific objective of this program would be to identify and classify the values implicit in the practices of researchers investigating the behavior of teachers. This would require the initial development of some instrument and/or method applicable to researchers in a naturalistic setting. The results would identify the limitations of the systems of ideas generated by researchers.

The program's tasks would be ordered in the following way:

1. Select frameworks and methods for identifying values in naturalistic settings, for video and interview sampling, and for showing relationships.

2. Set up and apply criteria for selection of research workers, contrasting settings, approaches, and fields of study.

3. Data collection and analysis.

4. Determine interactions between researchers and teachers, researchers and settings, and researchers and approaches.

Timing would have to coincide with the research schedule of the sample selected.

Program 10.4.5: Perform a Conceptual (Philosophical) Analysis of the Observational, Technical, and Theoretical Language of a Selected System for Studying Teaching.

Analytic philosophers have examined and illumined concepts in science, social science, general educational philosophy, and the ordinary language of education (see, for example, the work of such persons as Nagel, Kaplan, Louch, Winch, Scheffler, Peters, Green, and Soltis), with good results. Since the application of the techniques of analytic philosophy is a fairly straightforward process, any system designed to study teaching could be put to similar scrutiny.

This program therefore calls for the systematic application of such techniques to linguistic and conceptual systems used in the study of teaching. This could be handled by multiple independent projects to cover separate systems such as those defined by Panels 2-6 of this Conference. Projects of this sort would help clarify the "language" of research on teaching, and improve systematic thought by removing the confusion of observational technical-theoretical language which tends to interfere with meaningful communication between and within research efforts. Critical illumination of systems currently in use would be directly helpful to ongoing research in the data-gathering stage.

The major steps for each such project would be as follows:

1. Become familiar with a particular system or mode of studying teaching, reviewing all literature on development and use of the system.

2. Identify central concepts and logical relationships, and select the concepts to be analyzed.

3. Analyze the selected concepts, indicate the scope of their application, and identify logical problems (if any) with the system.

The completed project would be subjected to critical review by two highly skilled analytic philosophers serving as referees.

POSTSCRIPTS

1. Considering the needs of research and practice, the Panel regarded theory development in studies on teaching as falling into two broad categories -- descriptive and prescriptive. The Panel's first concern was descriptive theory and ways to attain better integration of educational theory and empirical research on teaching. Nonetheless, the Panel did not neglect prescriptive concerns and values in its descriptive schema and in its suggestions of programs and projects directed at the attainment of the Panel's major goal.

2. The Panel believes strongly that past practices of NIE in funding and regulating research and development efforts have inhibited theory development. It recommends that a panel consisting of NIE and field researchers be commissioned to examine this issue with a view toward revising policies governing support of theoretically-oriented research and theory development.

3. The Panel worked hard to meet the stated needs of the NIE planning conference. But it should be stated that the assignment addressed by this Panel particularly, and perhaps other panels as well, cannot be satisfactorily fulfilled in a four-day conference and a few further days of hasty writing. The Panel holds that its work should be reviewed and redone by a panel of experts allowed time (perhaps six months) for reading and reflection as well as discussion.

4. Exemplifying the above point, the Panel attempted to meet the conference format requirements by making some comparative significance ratings, cost estimates, etc., but felt uncomfortable about claiming much validity for such estimates. Recognizing that NIE and other readers of this report would like to have some sense of what the Panel judged to be the relative worth of the individual programs or projects, we have put some of these estimates in an Appendix table; but we reiterate that these must be interpreted in terms of the comments made above. Perhaps the main generalization from the table is that most of the projects addressed by the Panel are judged to be of high potential for return--whether that potential return is arrived at through high investment for outcomes of critical significance or lower investment for outcomes of contributory but not critical significance.

SUMMARY

The history of science suggests that theory development is indispensible to the advancement of scientific research and technology. Educational research, and particularly research on teaching, has suffered from inadequate theory development. Improved theory is necessary to organize research findings, guide further research, and, most important, to serve as a medium of communication between research and the practice of teaching.

Theorizing requires scientific creativity. There are relatively few creative theoreticians in the established sciences and fewer still in relatively new areas of research, such as education. Further, little is known about predicting or fostering creative theory development.

Nonetheless, some ideas that deserve to be tried out in educational research have been advanced. Panel 10 identified eight problems that need to be resolved if theoretical work is to be advanced and nine mechanisms that have some promise of reducing or eliminating one or more of these problems. The Panel then concentrated on the four most promising mechanisms. These became Approaches within which several research programs and projects were formulated.

The first Approach calls for the establishment of one or more permanent working groups for the comparative analysis, evaluation, and integration of theoretical developments. Such a group of scholars and research workers would provide a continuing review of theoretical work, identify theoretical needs in a cumulative and reflective way, and work toward improved understanding of metatheoretical and methodological constraints on theory development.

A second Approach is based or the observation that theory development in a substantive field requires long, hard work by researchers working alone, without short-term requirements as to schedule or productivity. Within this Approach, the Panel identified four programs that might be supported through five-year renewable grants. These programs dealt with work toward an understanding of (a) the psychological processes of theory construction; (b) the social, cultural, economic, and political processes that promote or inhibit theory development; (c) the ways in which theories are extended beyond the data they were designed to explain and are then tested for utility; and (d) the extent to which theories unique to teaching, as opposed to theories borrowed from social and behavioral science in general, are required. A fifth program, identified in general terms only, would provide individual scholars with time and resources for theoretical work in substantive areas to be specified later, as promising areas and individuals are identified.

In a third Approach, the Panel is concerned with instruction in theory development. Case studies of the process of theory construction and application would be assembled for analysis by research workers, teachers, and students. The Panel also considered other instructional devices to promote interest and skill in theoretical work; these devices would be developed as better understanding of the process was gained.

As a final Approach, the Panel identified a group of individual studies aimed at specific, delimited needs, namely, (a) identifying the implicit theories used by teachers; (b) developing a matrix of existing social and behavioral theories and constructs used in research on, or potentially applicable to, each of a variety of teaching problems or settings; (c) explicating the theoretical underpinnings of current research on teaching; (d) determining the value implications of various theoretical constructs, and the values of researchers that underlie these theories; and (e) analyzing the theoretical and technical language of different theories and observational systems.

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APPENDIX

RELATIVE POTENTIALS OF INDIVIDUAL PROGRAMS

RELATIVE POTENTIALS OF INDIVIDUAL PROGRAMS

APPROACHES & Programs	Critical to meet Approach	Success Proba-bility	Investment Years	Investment $ Rate	Potential Return on Investment	Comments
10.1: WORKING GROUPS FOR ANALYTIC INTEGRATION						
10.1.1: Working Groups for Analytic Integration	High	High	5+	Hi	High	Fundamental if Successful
10.2: THEORY DEVELOPMENT BY INDIVIDUALS						
10.2.1: Process of Theory Construction	Med.	?	5+	Lo	High	Immense potent, but creativity unpredictable
10.2.2: Processes Influencing Theory Production	Med.	?	5+	Me	High	"
10.2.3: Need for Theory Unique to Teaching	Med.	Med.	1+	Lo	High	Guide for future research
10.2.4: Extend Current Theory to New Domains	High	Med.	5	Me	High	Impact for other theory
10.2.5: Awards for Individual Research	High	High	2-5	Me	High	Start after 10.4.2 & 10.4.4
10.3 INSTRUCTION IN THEORY DEVELOPMENT						
10.3.1: Manual for Researchers & 10.3.2: Manual for Teachers	Med.	High	2	Lo	High	Complete after 10.4.1-10.4.3 results in
10.4: ONE-SHOT STUDIES ON DELIMITED NEEDS						
10.4.1: Implicit Theories of Teachers	High	High	3+	Hi	High	Precedes 10.3.2
10.4.2: Matrix of Constructs, Operations, Application	High	Med.	5	Hi	High	First step, but difficult
10.4.3: Theories Used in Teaching	Med.	High	2	Me	Med.	Parallels 10.4.2 in start
10.4.4: Values of Researchers in Teaching	Med.	High	2	Me	High	Helps explain explicit theory
10.4.5: Philosophical Analysis of System Languages	Low	High	1-	Lo	Med.	Benefit most to system users

- The estimates above should be interpreted as tentative only.
- Probrams with low $ investment are estimated as not more than $50,000/year at the most; those of medium $ investment could run somewhere between $50,000 and $100,000/year; programs of high $ investment could run as much as $200,000/year.
- The table should be interpreted only in terms of the comments made in Postscripts #2, 3, and 4 at the end of this report.

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